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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/676,860	09/30/2003	Norman R. Byrd	038190/294893	7651
826	7590	08/18/2006	EXAMINER	
ALSTON & BIRD LLP BANK OF AMERICA PLAZA 101 SOUTH TRYON STREET, SUITE 4000 CHARLOTTE, NC 28280-4000			WILKINS III, HARRY D	
			ART UNIT	PAPER NUMBER
			1742	

DATE MAILED: 08/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/676,860	BYRD ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Harry D. Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 July 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-3,5-7 and 9-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-7 and 9-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Status***

1. The rejections under 35 USC 112, 1<sup>st</sup> and 2<sup>nd</sup> paragraph have been withdrawn in view of Applicant's remarks and amendments.

### ***Claim Rejections - 35 USC § 112***

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 9-15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The specification describes using carbon or graphite in the shape of fibers or felt. Applicant has failed to provide an explicit definition for the term carbonaceous". As such, it is given its ordinary meaning, which is "containing carbon". Applicant failed to disclose an electrolytic polymerization on any material containing carbon. Thus, claim 9, reciting a "carbonaceous material" is rejected as being unsupported by the specification as filed.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sera et al (US 3,926,761) in view of Delamar et al with evidence from Nakama et al (US 5,126,017) and Byrd (US 4,405,427) (for claims 1-3) as well as "Applications of Carbon Fibers" (for claim 3).

Sera et al teach (see abstract, col. 4, lines 4-32 and 46-68) a method for depositing a layer of a resin on a conductive substrate including providing an aqueous solution comprising an organic compound (polybutadiene) and a basic compound (triethylamine) in a non-conducting (PVC) container, connecting the substrate to the cathodic end of a direct current source, providing a counter electrode connected to the anodic end of a direct current source and applying an electric potential to cause the ionized solution to flow to the substrate to create a layer thereon. The coated substrates were then washed with water to remove any excess chemicals from the surface.

Thus, Sera et al teach the invention substantially as claimed, with the difference between the claimed invention and the teachings of Sera et al being that Sera et al deposit the resin coating on steel plate and not a carbon fiber, nor using a graphite rod as the counter electrode.

However, Delamar et al teach (see abstract and title) depositing a polymer onto a carbon fiber by electrolytic/electrophoretic action.

Therefore, it would have been obvious to one of ordinary skill in the art to have substituted the conductive carbon fiber of Delamar et al as the substrate onto which the

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resin was deposited in the process of Sera et al because Delamar et al teach (see abstract) that the coated carbon fibers had improved bonding to the matrix when used in carbon-fiber/resin-matrix composite materials, thereby enhancing the mechanical properties of the composite.

One of ordinary skill in the art would have had a reasonable expectation of successfully applying the electropolymerization method of Sera et al to a conductive carbon fiber as taught by Delamar et al as evidenced by the teachings of Nakama et al. Nakama et al teach (see abstract and col. 5, lines 3-22) that conventional electropolymerization methods were known to be utilized for the coating of a vast array of substrates (working electrodes), including metals and carbon fibers.

The use of graphite counter electrodes (cathodes) would have been considered an obvious variation of the process since Byrd (see col. 9, lines 3-5) and Nakama et al (see col. 5, lines 17-22) each suggest that the composition of the counter anode was not critical, and that a metal or conductive non-metal (i.e.-graphite) was utilized.

The deposited resinous material would have been expected to form a "nanomolecular" layer at an initial stage of treatment.

Regarding claim 2, the polybutadiene was a polymer.

Regarding claim 3, one of ordinary skill in the art would have expected the formed resin coated carbon fiber to have formed covalent bonds between the fiber and the coating as evidenced by "Applications of Carbon Fibers" section 3.2 (pages 204-205).

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6. Claims 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sera et al (US 3,926,761) in view of Delamar et al with evidence from Byrd (US 4,405,427) (for claims 5-7) and "Applications of Carbon Fibers" (for claim 7) as applied above to claim 1, and further in view of Deichert et al (US 4,341,889) with evidence from Reichenbacher et al (for claims 5-7).

The teachings of Sera et al and Delamar et al are described above.

However, Sera et al and Delamar et al do not teach using an inorganic compound as the agent to be added to the carbon fiber surface, such as a polysiloxane polymer.

It is useful to note that the chemical attachment of the polymeric chains taught by Sera et al occurs by free radical formation as is noted by Reichenbacher et al (see pages 3432-3433).

Deichert et al teach (see paragraph spanning cols. 6 and 7) that polysiloxane polymers are formed, and when the formed polymer chain is added to, the reaction occurs by free radical polymerization.

Therefore, it would have been obvious to one of ordinary skill in the art to have utilized any free radical polymerizable substance, such as the polysiloxane polymer taught by Deichert et al as the material to be added to the surface of the carbon fiber in order to form carbon fibers coated with any desired polymeric coating according to the desired end use of the fiber.

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7. Claims 9-10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jakubowski et al (US 4,272,346) in view of Naarmann (US 4,749,451) with evidence from Byrd (US 4,405,427) and Nakama et al (US 5,126,017).

Jakubowski et al teach (see abstract and col. 12, lines 29-50) a process including electrodeposition of a polyamic acid onto a carbon fiber. Due to the inherent nature of the electrochemical reaction, the carbon fiber is inherently attached to the anode of a direct current source. The electrolyte utilized in the electrodeposition contained an organic (polyamic acids) and a basic substance (triethylamine). Jakubowski et al passed an electric current from a cathode to the anodic carbon fiber to electrodeposit a layer comprising the organic compound.

With respect to the step of advancing the material through a second bath in a continuous manner to remove excess chemicals from the formed nanomolecular layer, Jakubowski et al teach that rinsing with water washed away almost all of the electrodeposited polymer. Thus, one of ordinary skill in the art would have been motivated to utilize the rinsing step when an extremely thin coating layer was desired.

Jakubowski et al fail to teach using a graphite rod cathode. The use of graphite counter electrodes (cathodes) would have been considered an obvious variation of the process since Byrd (see col. 9, lines 3-5) and Nakama et al (see col. 5, lines 17-22) each suggest that the composition of the counter electrode was not critical, and that a metal or conductive non-metal (i.e.-graphite) was utilized.

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Jakubowski et al fail to teach a continuous processing method where the carbon substrate was advanced through a first bath, nor that the rinsing step occurred by advancing the carbon substrate through a second bath.

Naarmann teaches (see abstract and figure) a process for electropolymerization coating of carbon fibers where the fiber is continuously fed through a bath.

Therefore, it would have been obvious to one of ordinary skill in the art to have adapted the batch coating method of Sera et al and Delamar et al to be continuous in operation by utilizing the device disclosed by Naarmann for continuously coating the carbon fibers.

A similar bath for performing the rinsing step of Jakubowski et al would have been provided for containing the rinse solution to allow for continuous processing of the carbon fiber.

Regarding claim 10, Jakubowski et al teach using carbon fiber.

Regarding claim 12, Jakubowski et al teach using a polyamic acid solution.

8. Claim 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jakubowski et al (US 4,272,346) in view of Naarmann (US 4,749,451) as applied to claim 9 above, and further in view of Nakama et al (US 5,126,017).

Jakubowski et al fail to teach that the carbon material to be coated was a carbon cloth.

Nakama et al teach (see col. 5, lines 3-22) that electrodeposition of polymeric materials was known to be performed on various substrates, including carbon fibers and woven cloth of carbon fiber.



Therefore, it would have been obvious to one of ordinary skill in the art to have applied the coating method of Jakubowski et al to woven cloth of carbon fiber as suggested by Nakama et al when a coated carbon fiber mat was needed.

9. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jakubowski et al (US 4,272,346) in view of Naarmann (US 4,749,451) as applied to claim 9 above, and further in view of Pike (US 4,480,088).

It would have been obvious to one of ordinary skill in the art to have utilized a basic solution for the rinsing step of Jakubowski et al because the basic solution would have enabled better removal of excess polyamic coating since the polyamic substances were more soluble in basic solutions than in pure water as was known in the prior art as taught by Pike.

#### ***Allowable Subject Matter***

10. The following is a statement of reasons for the indication of allowable subject matter: Claim 13 would be allowable if rewritten in independent format and corrected to overcome the rejection grounds under 35 USC 112, 1<sup>st</sup> paragraph set forth above. The prior art does not reasonably teach or suggest the electrodeposition of a polymeric coating from a solution containing carboxymethylcellulose.

#### ***Response to Arguments***

11. Applicant's arguments filed 12 July 2006 have been fully considered but they are not persuasive. Applicant has argued that one of ordinary skill in the art would not have been motivated to have utilized the coating method of Sera et al for coating a carbon material.

In response, it is noted that the prior art contains various examples of electropolymerization methods that can be performed on any conductive substrate. See for example, Nakama et al addressed in the rejection grounds above. Based on the knowledge that electropolymerization reactions were capable of being performed on any conductive substrate, one of ordinary skill in the art would have been motivated to have combined the teachings of Sera et al and Delamar et al. With respect to the different bath chemistries utilized by Sera et al and Delamar et al, one of ordinary skill in the art would have been aware that different coating bath compositions were capable of coating the same substrates.


### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D. Wilkins, III whose telephone number is 571-272-1251. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V. King can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Harry D Wilkins, III  
Primary Examiner  
Art Unit 1742

hdw